

Tennessee Valley Authority, Post Office Box 2000, Decatur, Alabama 35609-2000

Karl W. Singer
Vice President, Browns Ferry Nuclear Plant

October 28, 1998

10 CFR 50.73

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D. C. 20555

Gentlemen:

In the Matter of)
Tennessee Valley Authority)

Docket No. 50-260

**BROWNS FERRY NUCLEAR PLANT (BFN) - UNIT 2 - DOCKET NO. 50-260 -
FACILITY OPERATING LICENSE DPR-52 - LICENSEE EVENT REPORT (LER)
50-260/1998003**

The enclosed report provides details concerning an automatic reactor scram on Unit 2 from 100 percent power. This event was the result of a valve failure which caused the generator stator cooling water to exceed the high temperature setpoint for the turbine trip which resulted in an automatic reactor scram. This report is submitted in accordance with 10 CFR 50.73 (a)(2)(iv) as an event that resulted in an automatic actuation of an engineered safety feature, including the reactor protection system.

Sincerely,


K. W. Singer

cc: See page 2

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U.S. Nuclear Regulatory Commission

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October 28, 1998

Enclosure

cc (Enclosure):

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LICENSEE EVENT REPORT (LER)

(See reverse for required number of
digits/characters for each block)ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS MANDATORY
INFORMATION COLLECTION REQUEST: 80.0 HRS. REPORTED LESSONS
LEARNED ARE INCORPORATED INTO THE LICENSING PROCESS AND FED BACK
TO INDUSTRY. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO
THE INFORMATION AND RECORDS MANAGEMENT BRANCH (T-8 F33), U.S.
NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555-0001, AND
TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF
MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1)

Browns Ferry Unit 2

DOCKET NUMBER (2)

05000260

PAGE (3)

1 OF 5

Reactor Scram From Turbine Trip Due To Failed Isolation Valve In Stator
Cooling System

EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MDNTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
10	01	1998	1998	003	00	10	28	1998	NA	
OPERATING MODE (9)		1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 5: (Check one or more) (11)							
POWER LEVEL (10)		100	20.2201(b)		20.2203(a)(2)(v)		50.73(a)(2)(i)		50.73(a)(2)(vii)	
			20.2203(a)(1)		20.2203(a)(3)(i)		50.73(a)(2)(ii)		50.73(a)(2)(x)	
			20.2203(a)(2)(i)		20.2203(a)(3)(ii)		50.73(a)(2)(iii)		73.71	
			20.2203(a)(2)(ii)		20.2203(a)(4)		X 50.73(a)(2)(iv)		OTHER	
			20.2203(a)(2)(iii)		50.36(c)(1)		50.73(a)(2)(v)		Specify in Abstract below	
			20.2203(a)(2)(iv)		50.36(c)(2)		50.73(a)(2)(vi)		or in NRC Form 366A	

LICENSEE CONTACT FOR THIS LER (12)

NAME

A. T. Rogers, Senior Licensing Project Manager

TELEPHONE NUMBER (Include Area Code)

(256) 729-2977

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS
B	TJ	ISV	A200	N					

SUPPLEMENTAL REPORT EXPECTED (14)

YES (If yes, complete EXPECTED SUBMISSION DATE).	NO	EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
	X				

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines) (16)

On October 1, 1998, at 0047 CDT, Unit 2 received a full automatic scram from 100 percent reactor power. The scram was generated by a main turbine trip which was the result of high generator stator cooling water outlet temperature. The reactor scram caused reactor water level to go below the low level setpoint (level 3) which generated a redundant scram signal and initiated the Primary Containment Isolation System, as expected. The low reactor water level signal also initiated the Standby Gas Treatment and Control Room Emergency Ventilation Systems. All systems responded as expected and all control rods fully inserted.

The root cause was failure of a normally open manual isolation valve which blocked the flow of stator cooling water through the associated heat exchangers. The failure resulted from the separation of the valve plug from the valve stem, which allowed the loose plug to be forced against the valve seat by system flow thus blocking the flow path to the heat exchangers. The failed valve was replaced. TVA will initiate preventative maintenance for periodic inspections of the normally open stator cooling water valves.

TVA is reporting this event in accordance with 10 CFR 50.73 (a)(2)(iv) as an event that resulted in an automatic actuation of an engineered safety feature, including the reactor protection system.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION	
Browns Ferry Unit 2	05000260	1998	003	00	2 OF 5

TEXT (If more space is required, use additional copies of NRC Form 366A) (17)

I. PLANT CONDITIONS

At the time of the event, Units 2 was at 100 percent power and Unit 3 was in Mode 5 with the reactor cavity flooded. Unit 1 was shutdown and defueled.

II. DESCRIPTION OF EVENT

A. Event:

On October 1, 1998, at 0047 CDT, Unit 2 received a full automatic scram and recirculation pump trip from 100 percent reactor power. The scram and recirculation pump trip were generated by a main turbine trip which was the result of high generator stator cooling water outlet temperature. The reactor scram caused reactor water level to go below the low level setpoint (level 3) which generated a redundant scram signal and initiated the Primary Containment Isolation System, as expected. The low reactor water level signal also initiated the Standby Gas Treatment and Control Room Emergency Ventilation Systems. All systems responded as expected and all control rods fully inserted.

The turbine trip was caused by the main generator stator cooling water [TJ] outlet temperature reaching the high temperature trip setpoint of 81 degrees C for the designed 70 second time delay, making up the two out of three logic for the turbine trip circuitry. The stator cooling water temperature exceeded its setpoint due to failure [B] of a manual isolation valve [ISV] which blocked the stator cooling water through the associated heat exchangers.

The scram resulted in the automatic actuation or isolation of the following PCIS [JE] systems and components:

- PCIS group 2, Shutdown cooling mode of Residual Heat Removal (RHR) [BO] system; drywell floor drain isolation valves; drywell equipment drain isolation valves [WP].
- PCIS group 3, Reactor Water Cleanup (RWCU) system [CE].
- PCIS group 6, primary containment purge and ventilation [JM], Unit 2 reactor zone ventilation [VB]; refuel zone ventilation [VA]; Standby Gas Treatment (SGT) [BH] system; Control Room Emergency Ventilation (CREV) [VI] system.
- PCIS group 8, Traversing Incore Probe (TIP) [IG].

This event is reportable in accordance with 10 CFR 50.73 (a)(2)(iv), as an event that resulted in an automatic actuation of an engineered safety feature, including the reactor protection system.

B. Inoperable Structures, Components, or Systems that Contributed to the Event:

None.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)
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Browns Ferry Unit 2	05000260	1998	003	00	3 OF 5

TEXT (If more space is required, use additional copies of NRC Form 366A) (17)

C. Dates and Approximate Times of Major Occurrences:

October 1, 1998 0040 hours CDT	Stator cooling water inlet temperature started to increase (from 110 degrees F) and outlet temperature starts to increase (from 140 degrees F).
October 1, 1998 0042 hours CDT	Operations received abnormal alarm in Control Room when stator cooling water inlet temperature reached alarm setpoint (117 degrees F).
October 1, 1998 0046 hours CDT	Stator cooling water outlet temperature reached trip setpoint 81 degrees C (178 degrees F).
October 1, 1998 0047 hours CDT	Turbine tripped on high stator cooling water temperature. Reactor scram and recirculation pumps tripped on turbine stop valve closure.
October 1, 1998 0054 hours CDT	Operations restarted a recirculation pump.
October 1, 1998 0115 hours CDT	Operations reset PCIS and secured SGT and CREV.
October 1, 1998 0223 hours CDT	A four-hour non-emergency report is made to the NRC pursuant to 10 CFR 50.72 (b) (2) (ii).

D. Other Systems or Secondary Functions Affected:

None.

E. Method of Discovery:

The operating crew observed an automatic reactor scram and recirculation pump trip due to the turbine trip.

F. Operator Actions:

Operations personnel responded to the event in accordance with plant procedures.

G. Safety System Response:

All required safety systems operated as designed.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)
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Browns Ferry Unit 2	05000260	1998	003	00	4 OF 5

TEXT If more space is required, use additional copies of NRC Form 366A) (17)

III. CAUSE OF THE EVENT

A. Immediate Cause:

The main generator stator cooling water outlet temperature reached the high temperature trip setpoint of 81 degrees C (178 degrees F) for the designed 70 second time delay, making up the two out of three logic for the turbine trip circuitry. The turbine trip caused the reactor scram and recirculation pump trip due to turbine stop valve closure.

B. Root Cause:

The root cause of this event was determined to be the failure of the inlet valve to the stator cooling water heat exchangers which is a normally open, angle globe valve. The valve plug separated from the stem and blocked the stator cooling water through the associated heat exchangers.

C. Contributing Factors:

This valve is configured such that the inlet flow enters perpendicular to the valve stem and exits around the valve plug resulting in flow pressure pushing the valve plug away from the valve stem. This is the only valve on the stator cooling water skid in this configuration and piping obstructions on the skid prevent mounting this valve in the normal orientation. The normal orientation of an angle valve is with inlet flow parallel to the valve stem resulting in flow pressure pushing the plug onto the valve stem and less turbulence across the valve.

IV. ANALYSIS OF THE EVENT

The generator stator high cooling water temperature was caused by the failure of a manual isolation valve which blocked the stator cooling water flow through the associated heat exchangers. The stator cooling water system is configured such that a portion of the stator cooling water flows through the a pair of series heat exchangers while the remainder bypasses the heat exchangers. A temperature control valve downstream of the heat exchangers maintains the desired stator cooling water temperature. The heat exchangers can be aligned for either series or parallel operation, but are normally aligned in series.

The event occurred when the normally open angle globe valve on the inlet to the first series cooler failed, blocking the stator cooling water flow path to the heat exchangers. The valve plug is threaded onto the valve stem and then secured in place with a retaining pin. The failure resulted from the separation of the valve plug from the valve stem, and the loose plug was swept against the valve seat by the system flow. Inspections indicate the pin failed due to long term wear caused by differential plug to stem movement which also damaged the threads on both the plug and stem. The flow path around the heat exchangers remained open, and thus the majority of system flow bypassed the heat exchangers. Stator cooling water temperature immediately began a steady increase, and the high temperature trip occurred approximately seven minutes after the failure. The failed valve was replaced. TVA will initiate preventative maintenance for periodic inspections of the normally open stator cooling water valves which should identify deterioration prior to a similar valve failure.

The evaluation of plant system and component responses to the event concluded that responses were as designed and within the time frames expected. Personnel performance was also evaluated and found to be timely, appropriate for the event and met expectations for performance during an event of this type. There were no equipment failures during or following the scram that complicated recovery. As a result, there were no threats to public health or safety.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION	
Browns Ferry Unit 2	05000260	1998	003	00	5 OF 5

TEXT (If more space is required, use additional copies of NRC Form 366A) (17)

V. CORRECTIVE ACTIONS

A. Immediate Corrective Actions:

The Operations crew stabilized the plant in Mode 3 (Hot Shutdown) using the appropriate operating instructions. No immediate actions could be implemented to correct the stator cooling water failure.

B. Corrective Action to Prevent Recurrence:

TVA will evaluate either modifying or replacing the normally open stator cooling water valves on Unit 2.¹

TVA will initiate preventative maintenance for periodic inspections of the Unit 2 and Unit 3 normally open stator cooling water valves.¹

TVA will evaluate the possibility of aligning the stator cooling water system heat exchangers for parallel operation.¹

VI. ADDITIONAL INFORMATION

A. Failed Components:

The failed valve is an ALOYCO 6-inch angle globe valve. This valve is part of a General Electric supplied generator cooling water package, and the valve appears to have been in service for the life of the plant. The valve plug is threaded onto the valve stem and then secured in place with a retaining pin. Inspections indicate the pin failed due to long term wear caused by differential plug and stem movement which also damaged the threads on both the plug and stem. After the pin failed, flow forces caused the plug to separate from the stem and then lodge in the valve seat.

B. Previous Similar Events:

LER 50-260/9401301 was similar in that it was caused by turbine trip due to stator cooling water high temperature and was reported pursuant to 10 CFR 50.73(a)(2)(iv). However, the root cause was a mechanical degradation of the stator cooling water temperature switch which resulted in a setpoint drift in the conservative direction thus premature operation of the switch. No corrective actions in the previous LER would have prevented the occurrence of the condition described in this report.

No other LERs have been issued which involve a failure of a manual valve in this system.

VII. COMMITMENTS

None.

¹TVA does not consider this corrective action a regulatory commitment. The completion of this item will be tracked in TVA's Corrective Action Program.

CATEGORY 1

REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR: 9811090163 DOC. DATE: 98/10/28 NOTARIZED: NO DOCKET #
FACIL: 50-260 Browns Ferry Nuclear Power Station, Unit 2, Tennessee 05000260
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SINGER, K.W. Tennessee Valley Authority
RECIP. NAME RECIPIENT AFFILIATION
Records Management Branch (Document Control Desk)

SUBJECT: ~~XXXXXXXXXX~~ 003-00 re automatic reactor scram on Unit 2
from 100% power. Event result of valve failure which caused
generator stator cooling water to exceed high temp setpoint
for turbine trip which resulted in automatic reactor scram.

DISTRIBUTION CODE: IE22T COPIES RECEIVED: LTR 1 ENCL 1 SIZE: 2+5
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